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# PORTABLE ELECTRONIC TERMINAL APPARATUS HAVING A PLURALITY OF DISPLAYS

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119 to Japanese patent application No. JPAP11-086099 filed on Mar. 29, 1999, the entire contents of which are hereby incorporated by reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention generally relates to a portable electronic terminal apparatus, and more particularly to a portable electronic terminal apparatus which includes a flip panel and a plurality of displays.

### 2. Discussion of the Background

Recently, the amount of information for electronic apparatuses to exchange has greatly been increased through data communications verification because of rapid proliferation of portable communications equipment and an establishment of the corresponding infrastructure. In such a circumstance, portability as well as data communications capability has become more important, especially in a portable electronic apparatus (e.g., a cellular mobile phone, a personal assistant device, and the like).

In general, it is difficult to obtain both portability and visibility at the same time in a portable electronic apparatus. Such an apparatus needs to be lighter and smaller for increased portability. For instance, the area reserved for the display of a portable electronic apparatus can be reduced to increase portability. Typically, a portable electronic apparatus has a single display on which various kinds of information are selectively shown as user instructions; such as a screen scroll function, a function for switching over to another function, and so forth. In such a portable electronic apparatus, the user is usually required to perform complex manipulation of the display to finally read incoming mail and/or information received from information service providers.

As one example of the portable electronic apparatus, a mobile cellular phone, as illustrated in FIG. 1, is provided to overcome the above-mentioned problem. The mobile cellular phone of FIG. 1 includes a main body 51, a display 51, an antenna 52, and a loudspeaker 53. In this mobile cellular phone, a mechanical key pad is not used, instead a touch-sensitive display is employed so as to fit in a relatively small area. Since the touch-sensitive display does not provide a tactile "click" response, the user is required to keep watching the display to make sure the input is entered properly. Therefore, the operability of the mobile cellular phone of FIG. 1 is reduced.

## SUMMARY OF THE INVENTION

The present invention provides a novel portable electronic terminal apparatus which includes a main body, an information input mechanism, a plurality of displays, a communications mechanism, and a flip panel. The main body has a hollow section. The information input mechanism enables input of information, including data and instructions. A plurality of displays display the information input through the input mechanism. The communications mechanism transmits and receives the input information. The flip panel is movably mounted on the main body and is configured to

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rotate to open and close about a side edge portion of the flip panel. This flip panel is retracted in the hollow section of the main body when closed. In addition, one of the plurality of displays is mounted on the side of the flip panel that is exposed when closed.

One of the plurality of the displays may be mounted on a surface of the hollow section of the main body.

Another display may be mounted on another side of the flip panel.

One of the displays operates when the flip panel is closed, and the other display operates when the flip panel is opened.

Each of the displays may be a polymer-film liquid crystal display.

The displays may selectively be used by a user instruction input through the information input mechanism.

## BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the present invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a diagram showing an overall view of a conventional mobile cellular phone;

FIG. 2 is a diagram showing an overall view of a portable electronic terminal apparatus according to an embodiment of the present invention;

FIG. 3 is a diagram showing the location of an open button of the portable electronic terminal apparatus of FIG. 2;

FIG. 4 is a diagram showing the portable electronic terminal apparatus of FIG. 2 with a flip panel opened;

FIG. 5 is a diagram showing a structure of a display included in the portable electronic terminal apparatus of FIG. 2;

FIGS. 6 and 7 are diagrams for showing an exemplary way of reading incoming mail on the portable electronic terminal apparatus of FIG. 2;

FIGS. 8 and 9 are diagrams showing a modified portable electronic terminal apparatus based on the portable electronic terminal apparatus of FIG. 2; and

FIGS. 10 and 11 are diagrams showing another modified portable electronic terminal apparatus based on the portable electronic terminal apparatus of FIG. 2.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

In describing preferred embodiments of the present invention illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the present invention is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents which operate in a similar manner.

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, and more particularly to FIG. 2 thereof, there is illustrated a portable electronic terminal apparatus 100 according to an exemplary embodiment of the present invention. The portable electronic terminal apparatus 100 includes a main body 1, an antenna 2, a loudspeaker 3, a flip panel 4, a first display 5, a data entry panel 6, a microphone 7, and a button 8.

In this exemplary embodiment, the main body 1 has a front surface divided into upper, middle, and lower regions

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to which the loudspeaker 3, the flip panel 4, and the data entry panel 6 are provided, respectively. The antenna 2 is mounted inside the main body 1 so as to protrude from the top surface of the main body 1. The microphone 7 is mounted on a portion of the lower region closer to the bottom surface of the main body 1, and the button 8 is provided to a side surface of the main body 1 near the upper region. The flip panel 4 has a left side edge portion which is movably mounted in the left side edge of the middle region of the main body 1 so that the flip panel 4 can rotate to open and close about the left side edge portion. The first display 5 is mounted on the front surface of the flip panel 4. The data entry panel 6 includes a ten-key pad, for example, and other instruction keys. In addition, the portable electronic terminal apparatus 100 further includes an open button 9 for opening the flip panel 4. The open button 9 is mounted on a side surface of the main body 1 close to the flip panel 4, as illustrated in FIG. 3.

When the open button 9 is pressed, the flip panel 4 is opened, as illustrated in FIG. 4. As illustrated in FIG. 4, the portable electronic terminal apparatus 100 further includes a second display 10, a third display 11, a hook 12, and a dent 13. A hollow section 14 is created when the flip panel 4 is opened. The second display 10 is mounted on a rear side of the flip panel 4. The second display 10 may be integral with the first display 5. The third display 11 is mounted on a portion of the main body 1 opposite to the second display 10 with the flip panel 4 closed so as to appear next to the second display 10 with the flip panel 4 opened. The hook 12 is provided to a side edge of the rear surface of the flip panel 4 so as to hook up to the main body 1 with the dent 13 mounted on the main body 1. The hollow 14 is to receive the flip panel 4 when it is closed. For the open/close mechanism of the flip panel 4, the portable electronic terminal apparatus 100 is further provided with a hook receiver (not shown) and a spring (not shown). The hook receiver is mounted on a portion of the main body 1 closer to the dent 13 and is engaged with the hook 12 when the flip panel 4 is closed. The spring is mounted on a portion of the left side edge of the flip panel 4 so as to provide a tension to the flip panel 4 to open. The above-mentioned hook receiver is associated with the movement of the open button 9 so that the flip panel 4 is opened, as illustrated in FIG. 4, with the tension of the spring when the open button is pressed and is closed, as illustrated in FIG. 2, when the user closes the flip panel 4.

Each of the first and second displays 5 and 10 may be a thinner display (i.e., a polymer-film liquid crystal display) so that the flip panel 4 can be made thinner.

Referring to FIG. 5, an exemplary structure of a display when the first and second displays 5 and 10 are united in one piece is explained. In FIG. 5, an exemplary structure of a display includes a reflection plate 20, first polarizing plates 21 and 22, first transparent electrodes 23 and 24, liquid crystal layers 25 and 26, second transparent electrodes 27 and 28, phase plates 29 and 30, second polarizing plates 31 and 32. That is, the first display 5 includes the first polarizing plate 21, the first transparent electrode 23, the liquid crystal layer 25, the second transparent electrode 27, the phase plate 29, and the second polarizing plate 31. Further, the second display 10 includes the first polarizing plate 22, the first transparent electrode 24, the liquid crystal layer 26, the second transparent electrode 28, the phase plate 30, and the second polarizing plate 32. The first display 5 is mounted on a front surface of and the second display 10 is mounted on a rear surface of the reflection plate 20 so that a double-sided display is configured with the flip panel 4.

When the flip panel 4 is closed, the first display 5 is supplied with power but the second and third displays 10 and

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11 are not supplied with power. That is, the second and third displays 10 and 11 can only be supplied with power when the flip panel 4 is opened. In addition, the user can set a condition in which the second and third displays 10 and 11 are not supplied with power through the data entry panel 6. Accordingly, the second and third displays 10 and 11 will not be supplied with power even when the flip panel 4 is accidentally opened. As a result, it becomes possible to avoid an increase of a power consumption by an accidental opening of the flip panel 4.

Referring to FIGS. 6 and 7, an exemplary way of using the portable electronic terminal apparatus 100 will be explained. When the portable electronic terminal apparatus 100 is not used, it stays in an idle status, as illustrated in FIG. 6. In the idle status, the flip panel 4 is closed and the first display 5 displays minimum information on it. The minimum information may include strength of the electric field (i.e., signal strength), the time of day, date, incoming mails, and so forth.

To read incoming mails, the user opens the flip panel 4 so that the second and third displays 10 and 11 show up, as illustrated in FIG. 7. In this case, the second display 10 shows a list of incoming mails and the third display 11 shows the contents of a selected incoming mail.

With the above-described structure, the portable electronic terminal apparatus 100 can conveniently display multiple pages of information. Moreover, it obviates the necessity for the user to enter the complex instructions through the data entry panel 6 to read incoming mails. Thus, the user can read incoming mails in much the similar way to read a book by turning pages.

Next, a first modification made to the portable electronic terminal apparatus 100 is explained with reference to FIGS. 8 and 9. In FIG. 8, a first modified portable electronic terminal apparatus 200 is shown. The first modified portable electronic terminal apparatus 200 of FIG. 8 is similar to the portable electronic terminal apparatus 100, except for a flip panel 204 and a knob 215.

The flip panel 204 of FIG. 8 is configured to have a top edge portion which is mounted on the top edge of the middle region of the main body 1. That is, the flip panel 204 can rotate about the top edge portion to open and close while the flip panel 4 of FIG. 2 rotates about the left side edge portion. The knob 215 is engaged with a bottom portion of the flip panel 204 when the flip panel 204 is closed and the flip panel 204 is retracted in the main body 1, as illustrated in FIG. 8. To open the flip panel 204, the user needs to push or slide the knob 215 to release its engagement with the bottom portion of the flip panel 204. Consequently, the flip panel 204 is opened towards the side of the loudspeaker 3, as illustrated in FIG. 9. Because of this direction of opening, the flip panel 204 is kept out of the way of the user's hand holding the main body 1.

Next, a second modification made to the portable electronic terminal apparatus 100 is explained with reference to FIGS. 10 and 11. In FIG. 10, a second modified portable electronic terminal apparatus 300 is shown. The second modified portable electronic terminal apparatus 300 of FIG. 10 is similar to the portable electronic terminal apparatus 100 of FIG. 2, except for a fixed display panel 316 and a flip panel 317. The fixed display panel 316 is fixed on the middle region of the main body 1. The flip panel 317 includes a secondary display 318, as illustrated in FIG. 11. The flip panel 317 is configured to have a bottom edge portion which is mounted on the bottom of the lower region of the main body 1. That is, the flip panel 317 can rotate about the bottom edge portion to open and close while the flip panel